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Invited Paper

Full-genome study of gene expression in lumbar spinal cord of mice after 30-day space flight on Bion-M1 biosatellite

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1. Introduction

Zero-gravity is one of the factors that negatively affect a man in space and it is not a surprise as the evolution of all living things proceeded in a one-G environment. The negative effects of zero-gravity set in while in space, but clinically manifest themselves following the cosmonauts' return to Earth, the usual one-G environment. All the systems of the organism, which adapted to the virtually weight-free environment, become incapable of regular performance in a one-G environment.

The effects of zero-gravity most strongly manifests in the impaired performance of the locomotor system: the strength and endurance of the muscles decrease, the structure and properties of the bones undergo transformation, and the systems responsible for constructing movements malfunction. This pathological condition is called a “Hypogravitational Locomotor Syndrome” (HLS). The history of long space flights shows that the most effective way of preserving the cosmonauts' performance and preparing them for the return to Earth is a regularly performed complex set of physical exercises in conditions imitating a one-G environment during the flight [1]. However, even diligent performance of specifically designed prophylactic sets of exercises fails to completely curb the development of HLS. It is obvious that the success of long inter-planetary flights will greatly depend on achievements in study of the pathogenesis of the HLS on the molecular, cellular and tissue levels.

Animals that have been in space in a biosatellite or held in an environment imitating zero-gravity play an important role in studies of HLS [2–4]. Such studies have shown HLS develops from an impaired afferent impulse from the limbs.

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